

MODELING COMPOUND

FIELD OF THE INVENTION

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The invention relates generally to a novel malleable modeling compound and in particular, to a non-toxic, extremely pliable compound suitable for children and adults.

BACKGROUND OF THE INVENTION

Modeling compounds such as clays and putties are widely known and have been commercially available for decades. The compounds are commonly used as play toys, creative materials, and orthopedic aids.

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Common examples of putties include, for example, borosiloxane bouncing putties shown in U.S. Patent No. 2,541,851 issued to Wright and U.S. Patent No. 3,677,997 issued to Kaiser, et al. Unlike conventional modeling clays, these compounds do not dry out or harden over time. While widely available, bouncing putties tend to have an undesirable greasy or oily tactile feel and may become permanently embedded in carpet and clothing fibers if left unattended. In addition, within minutes after molding bouncing putties into a desired shape, the compounds will flow or collapse downwardly like viscous fluids. This characteristic renders bouncing putties unacceptable for educational or creative uses.

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U.S. Patent No. 5,171,766 issued to Mariano discloses a non-oil based modeling dough resistant to flaking and cracking. However, a bounceable compound is not adequately obtained without reducing the shelf-life of the dough.

5 U.S. Patent No. 3,384,498 issued to Ahrabi discloses a plastic modeling compound comprising a significant portion of guar gum to provide an elastic, moldable compound suitable for utilization as a novelty item.

More recently, U.S. Patent No. 5,258,068 issued to Shapero, et al., sets
10 forth a safe non-toxic play material including, among other ingredients, guar gum, providing a play material exhibiting an improved tactile feel.

While the aforementioned inventions all exhibit some desirable qualities of modeling compounds and novelty toys, such as the ability to bounce or retain
15 shape, flexibility, pliability, etc., it is highly desirable to provide a modeling compound exhibiting all of these characteristics and more. In particular, it is also imperative to provide a non-toxic modeling compound due to the inherent risk of chewing or consumption of such compounds by young children.

20 Accordingly, it is an object of the present invention to provide an improved non-toxic modeling compound that is highly malleable and pliable.

Another object of the present invention is to provide a flexible, stretchable non-hardening modeling compound having the ability to retain a formed shape.

A further object of the present invention is to provide a non-greasy modeling compound having a unique tactile feel that will not become embedded into carpet, furniture and clothing.

5 A still further object of the present invention is to provide a method for the manufacture of a modeling compound which does not require heating or baking.

SUMMARY OF THE INVENTION

10 The above objects and advantages are achieved by an improved non-toxic modeling compound comprising a novel combination of known ingredients, including a rubber component, oils, filler materials, an antioxidant and other desirable additives.

15 The critical components of the invention include a copolymer rubber component, preferably a butyl rubber, and vulcanized vegetable oil, commonly known as factice. Modeling compounds formulated in accordance with this invention also include at least one filler, softening agent and preferably an antioxidant. Colorants and perfumes may be optionally added to complement the
20 base ingredients by enhancing the appearance of the modeling compound.

As would be recognized by one skilled in the art, the major application of butyl rubber, the preferred rubber component, is in the lining of tires and as a base ingredient in chewing gum. The exemplary properties exhibited butyl
25 rubbers, including flexibility and non-toxicity, are demonstrated in a modeling compound when formed in combination with the ingredients described herein.

The final product is a non-toxic, non-sticky, cohesive, malleable modeling compound stretchable in a manner similar to chewing gum.

The invention also contemplates a preferred tri-phase process of
5 manufacturing the modeling compound. Desirably, the method of the manufacture does not require heating or baking to obtain the finished product.

DETAILED DESCRIPTION

10 To achieve the above-described objects and advantages, a modeling compound according to the present invention comprises a copolymer rubber component of a butyl rubber and a vulcanized vegetable oil polymer (VVO). Though additional ingredients commonly found in modeling compounds and the like are utilized to manufacture the compound described herein, the butyl rubber/
15 VVO combination is particularly desirable as VVO serves to facilitate the incorporation of the necessary additives into the butyl rubber.

A copolymer rubber, particularly a butyl rubber, is utilized to form the basic material. Butyl rubber, also known as polyisobutylene, is a synthetic rubber or
20 elastomer primarily comprising isobutylene and to a much lesser extent, isoprene. Butyl rubbers have been found to exhibit a number of desirable qualities, including resistance against aging and low air permeability which makes these elastomers particularly suitable for use in modeling compounds when combined with compatible additives as described herein.

A halogenated butyl rubber, such as brominated (bromobutyl) rubber is specifically contemplated for use in the present invention as it is the most innocuous member of the butyl rubber family and, compared to butyl rubber, it can be covulcanized with other rubbers. A suitable bromobutyl rubber is 5 commercially available under the trade name EXXON® Bromobutyl 2244. It will be apparent to those skilled in the art, however, that any member of the butyl rubber family, including butyl rubber and chlorobutyl rubber, may be utilized.

Vulcanized vegetable oil (VVO), in addition to butyl rubber is a further 10 essential ingredient of the present invention. VVO, known industrially as factice, is a soft rubber material prepared by vulcanizing various vegetable oils, including linseed oil, soybean oil, sesame oil, rapeseed oil, canola oil and castor oil with sulfur or sulfur derivatives, such as sulfur chloride and the like. The product formed by reacting vegetable oil(s) with sulfur or a derivative thereof is preferred 15 for the present invention. From the vulcanization process, a crosslinking is obtained resulting in a pseudo polymer oil base.

Vulcanized oils may be used as extenders, processing aids, or plasticizers for natural or synthetic rubbers. In combination with the butyl rubber component 20 and other ingredients described herein, this polymerized oil causes the product to exhibit elastic and bounceable qualities while having a non-sticky, velvety tactile feel. The VVO also aids in the mixing or incorporation of other essential additives into the butyl rubber component. One preferred VVO, or factice, is

Caufit Factis Blanco 5210, but any commercially available VVO is suitable for use with the present invention.

Based on the total weight of the compound, butyl rubber and VVO are 5 preferably present in the following ranges:

	Ingredient	% By Weight
10	Butyl Rubber	4.0 – 30.0
	Vulcanized Vegetable Oil	4.0 – 30.0

15 The above-mentioned rubber composition also contains other conventional additives. For example, a sizable amount of at least one inorganic filler is incorporated into the mixture of butyl rubber and VVO to ultimately comprise from 25.0 to 60.0 percent of the total weight of the compound. A filler 20 material imparts to the finished compound a necessary non-tackiness, so that it will not stick to skin or other mediums. The preferred filler, dolomite, has a compact structure, providing a final modeling compound having an improved tactile feel. Dolomite also increases the ability of the modeling compound to be utilized as an eraser. While dolomite, available under the trade name 25 OMYACARB® is preferably utilized, it may be replaced by any carbonate or kaolin filler known in the art.

A softening agent is favorably incorporated in a proportion in the range from 5.0 to 15.0 percent of the total compound weight. The softening agent may

be selected from a large group of commercially available materials, including oils, plasticizers, or other agents having a softening activity. For example, any commercially available vegetable oil may be incorporated into the mixture. Such an agent is desirable to enhance softness and malleability of the rubber

5 compound. It has been discovered that food grade corn oil is particularly compatible with VVO, synergizing the soft feel of the compound. The enhanced softness makes the product especially suitable for molding by young children.

The modeling compound of the present invention preferably comprises an
10 additional oil component. Particularly compatible with butyl rubbers are paraffinic oils, such as the commercially available Vaseline grade Plastificante RS-32-Vaseline. While oils are generally used in combination with rubber based compounds as softening agents, paraffinic oil in the range from about 3.0 to 15.0 percent weight of the composition acts more as an agglomerating agent, i.e.,
15 binding agent, to consolidate the compound into a more compact cohesive material. The use of paraffinic oil improves the elasticity and non-tearing properties of the resultant compound. In addition, it has been found to improve non-staining, color, and low temperature properties of the rubber.

20 Paraffinic oil imparts enhanced copying properties to the modeling compound as well, so that when placed on a section of newspaper or comic book, the wording or image is lifted and viewable on the surface of the modeling compound. It has also been found that paraffinic oils increase the rebound

resilience of the compound. Typically, such qualities are only exhibited by borosiloxane bouncing or novelty putties.

Preferably, the composition also contains an antioxidant component.

5 Antioxidants are commonly utilized in the art to prolong the shelf-life of malleable compositions. By blending a small amount of antioxidant, in the range from about 0.2 to 3.0 percent weight of the composition, with the rubber compound, it is possible to prevent thermal degradation of softening agents and protect the rubber from the loss of flexibility.

10 While the antioxidant component is not particularly limited, preferable antioxidants are phenolic antioxidants, and in particular, the general purpose antioxidant butylated hydroxytoluene (BHT). BHT, available as IONOL® CP, which has FDA and BGA approvals for materials which come into contact with
15 food, is most desirable due to its non-toxic properties. The non-toxic BHT antioxidant, while preferred, may be replaced by any other antioxidant known to those skilled in the art as having the same performance.

A whitening pigment such as titanium dioxide (TiO_2) is also preferably
20 used to improve the appearance of the modeling compound blend. Titanium dioxide in the range from 0.3 to 5.0 percent weight of the composition imparts a brighter whiteness to the compound, resulting in a material having a clean appearance and enabling it to more effectively lift printed images from a newspaper or the like. Titanium dioxide, commercially available as TiPure R-
25 902, has been found to produce the aforementioned characteristics in the

compound of the invention. Those skilled in the art would recognize, however, that any commercially available brand of titanium dioxide could be utilized.

In addition, other optional but preferable additives, including colorants and
5 fragrances may be utilized in combination with the above-described modeling compound. Whether such additives are used is generally a matter of design choice to enhance the basic properties of the invention. The modeling compound of the present invention specifically contemplates the use of pigments, for example, Clariant non-black pigments, in the range from 0.0 to 2.0 percent
10 weight of the composition. Advantageously, the utilization of pigments avoids the undesirable staining characteristic associated with some colorants that tend to transfer color or impart stains on users' hands. If desired, it may also be beneficial to use STERLING® V/N660 Carbon Black to impart a black color into the compound.

15 Blending a fragrance with the rubber compound mixture may also be desirable to decrease the rubber like scent commonly associated with conventional modeling compounds. While any non-toxic fragrance may be used, Bouquet 5123 has been found to be one suitable aromatizing mix, preferably
20 present in the range from 0.2 to 0.6 weight percent.

The following EXAMPLE 1 illustrates the suitable ranges for a modeling compound in accordance with the present invention. All parts and percentages in the EXAMPLES and otherwise in the specification are by weight of the total
25 compound.

EXAMPLE 1

	Ingredient	% By Weight (Acceptable Range)
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Active:		
10	Butyl Rubber	4.0 – 30.0
	Vulcanized Vegetable Oil	4.0 – 30.0
	Filler	25.0 – 60.0
	Paraffinic Oil	3.0 – 15.0
	Softening Agent	5.0 – 20.0
	Antioxidant	0.2 – 3.0
15	Titanium Dioxide	0.3 – 5.0
Other:		
20	Pigments	0.0 – 2.0
	Aromatizing mixture	0.2 – 0.6

The preferred percentages by weight of the above additives have been discovered to include those set forth in EXAMPLE 2. EXAMPLE 2 illustrates the 25 preferred formulation of additives and corresponding percentages for producing a modeling compound most illustrative of the exemplary properties described herein. Manufactured in accordance with the method set forth below, the combination of ingredients in the preferred amounts results in a malleable, lightweight, non-hardening material having an improved tactile feel over conventional modeling compounds and putties. Importantly, while the improved 30 compound is extremely pliable, it can retain a molded shape for years if undisturbed.

EXAMPLE 2

	Ingredient	Preferred Ingredient	% By Weight (Preferred Range)
5	Butyl Rubber	Bromobutyl Rubber	17.0 – 19.0
	Vulcanized Vegetable Oil		17.0 – 19.0
10	Filler	Dolomite	41.0 – 43.0
	Paraffinic Oil		10.0 – 12.0
	Softening Agent	Corn Oil	7.0 – 9.0
	Antioxidant	Butylated Hydroxy Toluene (BHT)	0.3 – 0.4
	Titanium Dioxide		2.0 – 4.0
15	Pigments		0.05 – 0.1
	Aromatizing mixture		0.2 – 0.4

When produced in accordance with the method of the invention, this combination of specific additives in the preferred amounts produces a velvety,

20 non-oily, bounceable and cohesive compound which is advantageously stretchable in a manner similar to chewing gum. More specifically, the compound can be stretched substantially greater distances than conventional bouncing putties because the compound of the present invention is both cohesively bound together and maintains an excellent plastic/elastic ratio.

25 Therefore, it is much less likely to break apart than conventional flexible putties when stretched from opposing ends. It has been found that in addition to a play material, the compound of the present invention may also be utilized for improving dexterity, stress relief and as a sculpting material.

30 To obtain a modeling compound with the advantageous properties and characteristics described, the present invention contemplates a tri-phase process for preparing the composition. The ingredients mentioned in EXAMPLES 1 and 2

are added or mixed in one or more of the three phases. It will be apparent to one skilled in the art, however, that other additives exhibiting similar characteristics to the preferred ingredients may replace those exemplified in the method herein. Other constituents of an equivalent nature known to those skilled in the art are 5 considered within the teachings of this invention.

PHASE I of the method preferably comprises a pre-mixture of bromobutyl rubber, BHT antioxidant, titanium dioxide, paraffinic oil, VVO and dolomite. With reference to the acceptable and preferred ranges in percentages by weight of the 10 total composition, as set forth in EXAMPLES 1 and 2, the ingredients are combined in the following percentage amounts:

PHASE I

15	Ingredient	Preferred Ingredient	% of Total From EXAMPLES 1 & 2	% By Weight of Total Composition (Preferred)	% By Weight of Total Composition (Acceptable Range)
20	Butyl Rubber	Bromobutyl	100	17.0 – 19.0	4.0 – 30.0
	Antioxidant	BHT	100	0.3 – 0.4	0.2 – 3.0
	Titanium Dioxide		100	2.0 – 4.0	0.3 – 5.0
	Paraffinic Oil		90	9.0 – 10.8	2.7 – 13.5
	VVO		5	0.85 – 0.95	0.2 – 1.5
25	Filler	Dolomite	5	2.05 – 2.15	1.25 – 3.0

With particular reference to the preferred ingredients, the addition of the 30 PHASE I ingredients in the above amounts promotes the dispersion of BHT and titanium dioxide into the bromobutyl rubber, facilitating the production of a flexible, whitened rubber compound. Another object of PHASE I is to soften the bromobutyl rubber by incorporating paraffinic oil therein, which further promotes

the dispersion of ingredients into the rubber base. The ingredients comprising the modeling compound are preferably blended together at a slightly slow speed in an internal mixer, such as a BANBURY® Mixer. As would be understood by one skilled in the art, the mixing could also take place in an open mill or other sophisticated mixing apparatus. Advantageously, no heating or artificial temperature conditions are required to adequately combine the ingredients to form a cohesive compound.

In PHASE II of the present method, preferably about 50 percent of the total pre-mixture produced during PHASE I is combined with the ingredients set forth below in the following percentage amounts:

PHASE II

15	Ingredient	Preferred Ingredient	% of Total From EXAMPLES 1 & 2	% By Weight of Total Composition (Preferred)	% By Weight of Total Composition (Acceptable Range)
20	VVO		95	16.15 – 18.05	3.8 – 28.5
	Filler	Dolomite	95	38.95 – 40.85	23.75 – 57.0
	Softening Agent	Corn Oil	100	7.0 – 9.0	5.0 – 15.0
	Paraffinic Oil		10	1.0 – 1.2	0.3 – 1.5
25	Pigments		100	0.05 – 0.1	0.0 – 2.0

During PHASE II, the continued softening of the bromobutyl rubber occurs with the slow mixing of the remaining paraffinic oil and corn oil. In addition, the desired pigments, while optional, are preferably mixed into the composition during PHASE II to promote their dispersion into the filler and the fraction of the pre-mixture present. The ingredients are blended until the pigments are evenly dispersed and an elastic, pliable compound is produced.

During PHASE III, the remaining 50 percent of the pre-mixture is combined with 100 percent of the well-blended mixture produced during PHASE II. In addition, it is preferred that a fragrance in the range from about 0.2 to 0.6 percent of the total compound weight is mixed therein. After the compound is thoroughly mixed forming a cohesive, non-tacky unit, it may be extruded into the in desired amounts into suitable containers.

The non-toxic finished product, unlike conventional putties, is non-tacky, highly stretchable and can even be molded into tall, thin formations maintaining the ability to retain a formed shape.

In addition, the modeling compound of the present invention is extremely malleable and will not harden over time like conventional modeling compounds.

It should be understood that in addition to the preferred method of manufacturing this novel modeling compound, variations in the manner of admixing will become apparent to those skilled in the art.

It will also be understood that the preferred method outlined above utilizes specific additives discovered to provide a diverse and desirable combination of exemplary properties exhibited by a modeling compound. However, the present invention contemplates the use of such preferred ingredients and other ingredients having similar properties and characteristics.

For the foregoing reasons, the scope of this invention is to be defined by
the appended claims.

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